Third Embodiment

A third embodiment of this invention is similar to the first embodiment thereof except for design changes mentioned hereafter. Fig. 5 is a flowchart of a segment of a program for a

5 microcomputer 90 (see Fig. 1) according to the third embodiment of this invention. The program segment in Fig. 5 is a modification of the program segment in Fig. 3.

As shown in Fig. 5, a first step 110 of the program segment sets the power control signal into the state corresponding to lower

10 than the normal power.

A step 120 following the step 110 outputs the light-emission start requirement signal and the pulse-width control signal to the signal generation circuit 40 (see Fig. 1). Therefore, the pulse generation circuit 40 outputs a pulse of the transmission signal to

15 the laser-diode drive circuit 12 (see Fig. 1). The time point of the leading edge of the pulse is determined by the light-emission start requirement signal, while the width of the pulse is determined by the pulse-width control signal.

The laser-diode drive circuit 12 activates the laser diode 11

20 (see Fig. 1) in response to the pulse of the transmission signal so that the laser diode 11 emits a corresponding pulse of the laser light. The time point of the leading edge of the pulse of the laser light is determined by the light-emission start requirement signal, while the width of the pulse of the laser light is determined by the

25 pulse-width control signal. Since the power control signal is in the state corresponding to lower than the normal power, the power of

the pulse of the laser light is lower than the normal power. The pulse of the laser light is made into a pulse of the forward laser beam. Since the power of the pulse of the forward laser beam is relatively low, the measurable distance to an object is shorter than

5 normal one. Accordingly, only in the presence of an object spaced from the subject vehicle by shorter than the normal measurable distance, the comparator 35 (see Fig. 1) outputs a high-level decision signal representing the reception of an echo.

A step 125 subsequent to the step 120 derives the measured

10 time interval from the output signal of the time measurement circuit 50 (see Fig. 1). The step 125 calculates the distance to the detected object from the subject vehicle on the basis of the measured time interval and the velocity of light. In the absence of a received echo, the step 125 detects the absence of a detected

15 object from the output signal of the time measurement circuit 50.

A step 131 following the step 125 determines whether or not the calculated distance to the detected object is shorter than a predetermined reference value, that is, whether or not the calculated distance to the detected object is in a prescribed short

20 range. In the case where the calculated distance to the detected object is shorter than the predetermined reference value, the program exits from the step 131 and then the current execution cycle of the program segment ends. On the other hand, in the case where the calculated distance to the detected object is not shorter

25 than the predetermined reference value or in the case where a detected object is absent, the program advances from the step 131

to a step 140.

The step 140 sets the power control signal into the state corresponding to the normal power. After the step 140, the program advances to a step 150.

5   The step 150 outputs the light-emission start requirement signal and the pulse-width control signal to the signal generation circuit 40. Therefore, the pulse generation circuit 40 outputs a pulse of the transmission signal to the laser-diode drive circuit 12. The time point of the leading edge of the pulse is determined by the

10   light-emission start requirement signal, while the width of the pulse is determined by the pulse-width control signal.

The laser-diode drive circuit 12 activates the laser diode 11 in response to the pulse of the transmission signal so that the laser diode 11 emits a corresponding pulse of the laser light. The time

15   point of the leading edge of the pulse of the laser light is determined by the light-emission start requirement signal, while the width of the pulse of the laser light is determined by the pulse-width control signal. Since the power control signal is in the state corresponding to the normal power (see the step 140), the power

20   of the pulse of the laser light is equal to the normal power. The pulse of the laser light is made into a pulse of the forward laser beam. Since the power of the pulse of the forward laser beam is equal to the normal power, the measurable distance to an object is equal to normal one. Only in the presence of an object spaced from

25   the subject vehicle by equal to or shorter than the normal measurable distance, the comparator 35 outputs a high-level